April 6, 2017 to April 11, 2017 Pond 4 Discharge Calculations

Atlantic Richfield Company's (AR) Leviathan Pond 4 Volumetrics October 2011 spreadsheet was used to calculate the following Pond 4 discharge volumes.

On April 6, 2017 when RWQCB personnel first discovered the partially detached overflow pipe, the reading on the USGS staff gauge that was attached to the overflow pipe (and has since been replaced) was approximately 6.6 ft (see attached photo). The base of the partially detached overflow pipe is at approximately 5.5 ft according to the USGS staff gauge. The corresponding elevation for the staff gauge reading of 6.6 ft and 5.5 ft on AR's Volumetrics spreadsheet (see attached spreadsheet) would be an elevation of 6914.1 and 6913.0 respectively. In determining the discharge volume, it is assumed AR used a USGS staff gauge elevation of 6.5 ft which is an elevation of 6914.0 on AR's Volumetrics spreadsheet.

According to AR's Volumetrics Spreadsheet:

The volume of water located in Pond 4 at an elevation of 6914.1 is 3909 yd^3

The volume of water located in Pond 4 at an elevation of 6914.0 is 3801 yd^3

The volume of water located in Pond 4 at an elevation of 6913.0 is 2767 yd^3

From the night of April 6, 2017 till April 11, 2017, when final repair of the Pond 4 overflow was completed, approximately three inches of total moisture fell at the SNOTEL Site located on Monitor Pass. According to USGS staff readings, the upper Pond elevations increased by 0.2 ft during this time period due to direct precipitation. Since the upper Pond elevations are a more accurate representation of site conditions, the 0.2 ft is used in the calculations that include direct precipitation. According to AR's Pond 4 survey data from 2012, the surface area on which direct precipitation runs into Pond 4 is approximately 36,400 ft^2. Given the surface area of 36,400 ft^2 and a direct precipitation amount of 0.2 ft, approximately 7280 ft^3 or 270 yd^3 of direct precipitation entered Pond 4 between April 6, 2017 and April 11, 2017.

The temporary repair performed by AR on April 7, 2017 was successful at reducing Pond 4 discharge flow to Leviathan Creek for only a short period of time. At 15:42 on April 7, 2017, RWQCB personnel observed that the temporary repair of the Pond 4 overflow pipe had failed. From April 7, 2017 till the final repair on April 11, 2017 Pond 4 discharged to Leviathan Creek until Pond 4 reached the USGS staff gauge reading of 5.5 ft. This would result in the elevation of Pond 4 being 6913.0 on April 11, 2017 when the Pond 4 overflow was repaired.

Given the above information, the following discharge amount scenarios have been calculated:

1 foot of discharge from Pond 4 not including direct precipitation

3801 yd^3 – 2767 yd^3 = **1034 yd^3 (208,837 gallons)**

1.1 feet of discharge from Pond 4 not including direct precipitation

3909 yd^3 – 2767 yd^3 = **1142 yd^3 (230,650 gallons)**

1 foot of discharge from Pond 4 including direct precipitation

3801 yd^3 – 2767 yd^3 + 270 yd^3 = **1304 yd^3 (263,374 gallons)**

1.1 feet of discharge from Pond 4 including direct precipitation

3909 yd^3 – 2767 yd^3 + 270 yd^3 = **1412 yd^3 (285,187 gallons)**

Since the Mine site did receive precipitation from April 6, 2017 to April 11, 2017, one of the last two discharge amount scenarios would be the most plausible.


04/06/2017 10:14

Leviathan Pond 4 Volumetrics October 2011

Outlet elevation 6916.03, Transducer elevation 6910.49

Elevation	Volume in interval (cu yds)	Volume below elevation (cu yds)	Area at elevation (sq ft)
6909.1		0	8
	0		
6909.2		0	37
	2		
6909.3		2	1442
	10		
6909.4		12	4134
	21		
6909.5		33	6896
	30		
6909.6		63	9418
	40		
6909.7		103	11922
	48		
6909.8		151	13766
	54		
6909.9		205	15342
	60		
6910.0		265	16819
	64		
6910.1		329	17858
	68		
6910.2		397	18510
	70		
6910.3		467	18988
	71		
6910.4		538	19423
	73		
6910.5		611	19831
	74		
6910.6		685	20207
	75		
6910.7		760	20514
	77		
6910.8		837	20790
	78		
6910.9		915	21062
	79		
6911.0		994	21334
	80		
6911.1		1074	21593
	81		
6911.2		1155	21852
	82		
6911.3		1237	22111

Assumed water depth at shutdown

Volume

108654.5 Gal

	82		
6911.4		1319	22371
	83		
6911.5		1402	22632
	84		
6911.6		1486	22893
	85		
6911.7		1571	23150
	86		
6911.8		1657	23405
	87		
6911.9		1744	23661
	88		
6912.0		1832	23917
	89		
6912.1		1921	24170
	90		
6912.2		2011	24425
	91		
6912.3		2102	24680
	92		
6912.4		2194	24937
	93		
6912.5		2287	25196
	94		
6912.6		2381	25455
	95		
6912.7		2476	25716
	96		
6912.8		2572	25978
	97		
6912.9		2669	26241
	98		
6913.0		2767	26501
	99		
6913.1		2866	26760
	100		
6913.2		2966	27022
	101		
6913.3		3067	27285
	102		
6913.4		3169	27550
	103		
6913.5		3272	27815
	104		
6913.6		3376	28078
	105		
6913.7		3481	28335
	106		
6913.8		3587	28586
	107		
6913.9		3694	28837

	107			
6914.0		3801	29086	
	108			
6914.1		3909	29330	
	109			
6914.2		4018	29574	
	110			
6914.3		4128	29816	
	111			
6914.4		4239	30058	
	112			
6914.5		4351	30301	
	113			
6914.6		4464	30545	
	114			
6914.7		4578	30790	
	115			
6914.8		4693	31036	
	116			
6914.9		4809	31284	
	117			
6915.0		4926	31533	Assumed Max Capacity (1 foot below outlet elevation)
	117			Additional 0.03 feet
6915.1		5043	31783	Volume Surface Area
	118			35.1 74.976
6915.2		5161	32034	Gal Feet
	119			
6915.3		5280	32286	
	120			
6915.4		5400	32540	
	121			
6915.5		5521	32794	
	122			
6915.6		5643	33050	
	123			
6915.7		5766	33307	
	124			
6915.8		5890	33566	
	125			
6915.9		6015	33825	
	126			
6916.0		6141	34086	Outlet
	118			Additional 0.03 feet
6916.1		6259	34351	Volume Surface Area
				35.4 79.677
				Gal Feet